```
A :  15
          > 36
B :  51        > 8
          > 44
C :  95        > 8
          > 52
D : 147
```

Again, note that the consecutive vertex sums differ by 1, while the consecutive perimeter sums have a 2nd difference of 8. Verify that these two patterns hold if other sequences of nested pentagons are drawn with the same orientation, but positioned elsewhere on the extended subtraction table.

Challenge: Draw nested isosceles triangles with the same orientation as those of Tables 1 through 3 on an extended multiplication table. Do similar patterns hold?

RECOMMENDATIONS FROM A LEADERSHIP CONFERENCE* ON MIDDLE SCHOOL MATHEMATICS

Patricia S. Wilson
The Ohio State University
Columbus, Ohio

Introduction:

The performance of students in mathematics programs in Ohio can be improved. Presently about 45% of the graduates of Ohio secondary schools progress on to some form of higher education and about 45% of those students must take some form of remedial mathematics. Improvements can be made at many levels in the school, but an arena of particular concern is the middle school program. Only about one-sixth of the school systems in Ohio retain the traditional junior high school administrative pattern. In the shift to different curricular and administrative arrangements, new issues and problems in making mathematics teaching and learning effective have developed. A leadership conference was convened to address these issues and concerns as a pre-session

* The Leadership Conference on Middle School Mathematics was funded by The Ohio State University, College of Education and College of Mathematical and Physical Sciences in conjunction with the Ohio Department of Education.

for the annual meeting of the Ohio Council of Teachers of Mathematics. The enthusiasm and concern of the participants in dealing with the issues and problems of middle school mathematics, suggested that the ideas and recommendations emanating from the conference would be of broad concern to mathematics educators in Ohio. Hence, the recommendations from the conference are offered below for your consideration.

The conference included presentations, a panel discussion, and small group working sessions. The 65 participants included mathematics supervisors, department chairs, teachers, and university personnel. Of particular concern were problems and issues relating to curriculum, instruction, and teacher preparation. The diversity of background of the participants provided an opportunity for reporting information, discussing ideas and programs, and for identifying common areas of concern. Although the one day session was too short to reach consensus on some important issues, the group mandated action in several areas. By providing middle school mathematics immediate attention, school districts can take advantage of the national interest and imperative to improve mathematics instruction. The recommendations of the participants provide a challenge to mathematics educators across Ohio whether their responsibilities are teaching at the middle school level or elsewhere.

The conference concluded with an afternoon session in which the recommendations were compiled and the participants were challenged to return to their districts to begin action that would improve middle school mathematics. How could you, your school, or your district implement the recommendations?

Recommendations for Curriculum:

1. Problem solving should be the primary focus of the middle school mathematics curriculum. More attention needs to be given to the transfer of learning and the use of mathematical models.
2. There should be continuity in the curriculum with a helpful balance among the areas of mental arithmetic,

paper and pencil calculations, estimation, calculator and computer use.

3. There should be a guideline for middle school courses similar to the Department of Education's Monograph series by Steve Meiring. Content descriptions, objectives, and sample problems are necessary.
4. New topics such as discrete mathematics, probability, statistics and modeling need more emphasis in the curriculum.
5. Computer literacy that supports building mathematical concepts needs to be taught in the mathematics classroom. General computer literacy instruction should not be delegated to the mathematics course time.

Recommendations for Instruction

1. Instructional methods that encourage higher order thinking processes should be emphasized in all middle schools mathematics classes.
2. Flexibility should be incorporated into any kind of instructional grouping that occurs. It is important that students be able to change groups as the need arises.
3. Administrative groups (principals, superintendents, etc.) should be influenced to encourage better instruction. For example, administrators need to be able to recognize good instruction in mathematics, to support teacher's participation in professional meetings, and to organize opportunities for teachers to observe other instruction in their own and other schools.
4. In-service programs of high quality are necessary to stimulate better instruction. OCTM's list of resource people and quality in-service programs should be updated. Successful programs, speakers, resources and current costs should be documented. Information should be solicited from a broad base.

Recommendations for Teacher Education

1. The Ohio Department of Education should require middle school mathematics certification in order to insure a quality middle school mathematics program.
2. Elementary certification should require strong mathematics preparation so that middle school certification can be gained by additional courses or a concentration in middle school mathematics. This will insure better mathematics instruction in pre-middle school mathematics courses.
3. Certification for a middle school mathematics specialist should include course requirements in teaching with computers, geometry, and additional mathematics courses that can be applied at the middle school level.
4. Mathematics classes could include calculus, discrete mathematics, linear algebra, statistics, and probability. The courses should be designed so the content is presented less formally and can be integrated into the middle school mathematics program.
5. Middle school teachers should participate in designing the certification requirements for middle school mathematics teachers.
6. State or federal support for mathematics specialist programs should be requested.
7. Programs are needed to upgrade the preparation of teachers who have insufficient background in mathematics, or lack of knowledge about working with middle school children.
8. A master's degree program for mathematics specialists in the middle schools is needed.
9. The courses should be accessible to teachers during the summer and at in-service programs. Access should be throughout the state.
10. Students entering teacher education programs should have successfully completed a college preparatory curriculum

in secondary school, or equivalent remedial courses at the college level.

11. Instructors teaching methods courses in middle school mathematics should periodically teach mathematics at the middle school level.

12. Teacher preparation courses in mathematics and mathematics education should use and emphasize calculators and computers as tools for doing and teaching mathematics.

Institutional and Individual Responsibilities

In order to support the implementation of changes in middle school mathematics, institutions need to take action:

1. The Ohio Department of Education, the Ohio Council of Teachers of Mathematics, and the Ohio Section of the Mathematics Association of America should coordinate efforts for implementation of the recommendations.

2. A network of mathematics supervisors should be formed to support classroom teachers in their attempts to strengthen mathematics instruction in the middle schools. The network should gather information and help to implement programs that address the recommendations of the conference.

3. The Ohio Department of Education should require middle school mathematics certification in order to insure a quality middle school mathematics program.

4. Universities and colleges throughout Ohio should provide programs that specifically address mathematics in the middle school.

The responsibility for implementation in the classroom belongs to the individual teacher. Each person, school, and district should consider the recommendations and take action to improve middle school mathematics.